

First Name	
Last Name	
Date	
Total Marks	/ 100 marks

MathsMadeEasy

# GCSE Mathematics

## Non-Calculator

## Higher Tier

## Free Practice Paper

1 hour 45 minutes



Answers at:

<http://www.mathsmadeeasy.co.uk/gcsemathspastpapers-higher.htm>

### Instructions

Write your name and other details in the boxes above.

Answer all the questions

Take  $\pi$  to be 3.142

### Information

Marks are shown in brackets for each question (2)

**Calculators may NOT be used**

### Advice

Don't spend too long on one question

Show all your working in calculations for full marks

You will get marks for method even if your answer is incorrect

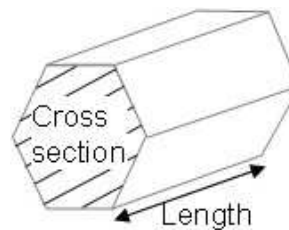
Leave a question until later if you cannot answer it

### Materials needed for examination

Ruler marked in centimetres and millimetres,  
protractor, compasses, pen, pencil, rubber  
Tracing paper may be used

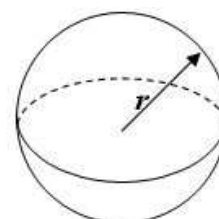
## Formulae sheet — Higher tier

**Volume of prism** = area of cross-section  $\times$  length



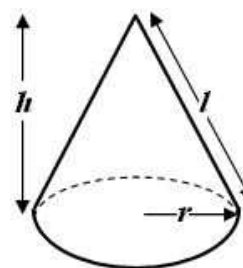
**Volume of sphere** =  $\frac{4}{3} \pi r^3$

**Surface area of sphere** =  $4\pi r^2$



**Volume of cone** =  $\frac{1}{3} \pi r^2 h$

**Curved surface area of cone** =  $\pi r l$

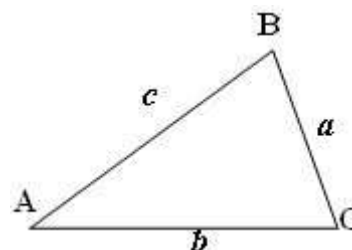


**In any triangle ABC**

**Sine Rule:**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule:**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of a triangle** =  $\frac{1}{2} ab \sin C$



**The Quadratic Equation**

The solutions of  $ax^2 + bx + c = 0$ , where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

### Authors Note

Every possible effort has been made to ensure that everything in this paper is accurate and the author cannot accept responsibility for any errors.

Apart from any fair dealing for the purposes of research or private study as permitted under the Copyright, Designs and Patents Act 1988, this paper may only be reproduced, stored or transmitted in any form or by any means with the prior permission in writing of the author, or in the case of reprographic reproduction in accordance with the terms and licence by the CLA. Enquiries concerning reproduction outside these terms should be sent to the author.

The right of David Weeks to be identified as the author of this work has been asserted by him in accordance with the Copyright, Designs and Patents Act 1988.

Question	Type of question	Marks
1	Estimation	3
2	Formula substitution	4
3	Ratio	2
4	Velocity – time graph	4
5	Fractions	4
6	Areas triangle, circle, volume	6
7	Median, Mean, Range	4
8	Algebra – simplify, expand, solve, quadratic, DOTS	12
9	3D Net, density	4
10	Construction – perpendicular line	2
11	Algebra	2
12	Similar triangles, similar volumes – scale factors	6
13	Cumulative frequency	5
14	Enlargement	3
15	Probability	6
16	Subject formula	3
17	Recurring decimal conversion	3
18	Completing the square	3
19	Transformation	3
20	Variation	5
21	Indices/ surds	8
22	Factorise/solve $ax^2 + bx + c$	3
23	Vectors	5

**Answer ALL questions.**  
**Write your answers in the spaces provided.**  
**Do NOT use a Calculator**

**Show all your working.**

1. a) Estimate the answer to:  $14.1 \times 99$   
 Show your working.

.....  
 (1)

- b) Estimate :  $\frac{14.9 \times 40.1}{9.7 \times 3.1}$

.....  
 (2)

2. The formula  $v = u + at$  gives the final velocity of an object as it accelerates.

- a Find the value of  $v$  when:

- i  $u = 20$ ,  $a = 5$  and  $t = 9$

.....  
 (2)

- ii if  $v = 35$ ,  $a = 4$  and  $t = 5$  find  $u$

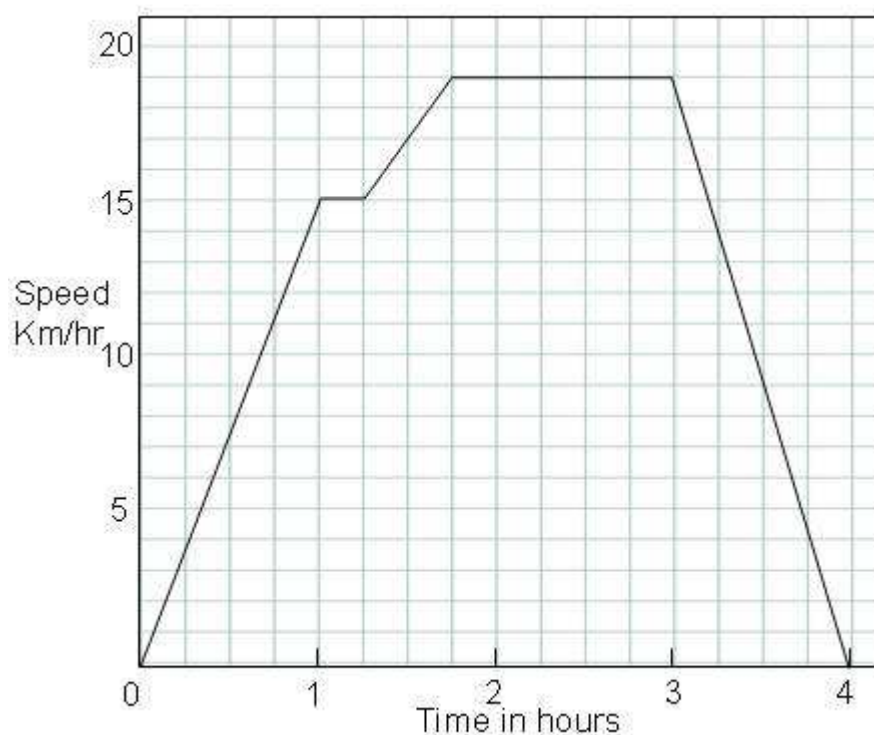
.....  
 (2)

3. David, Jane and Matthew shared out £1000 between them in the ratio 4 : 6 : 10

How much did they each get.

£..... and £..... and £.....  
 (2)

4. The graph below is a **velocity-time** graph.



- a) How many times was the acceleration zero?

.....  
(1)

- b) What is the acceleration during the first part of the graph

.....  $\text{kph}^2$   
(1)

- c) What was the distance travelled in the first hour

..... km  
(1)

- d) What was the deceleration shown by the graph

.....  $\text{kph}^2$   
(1)

5. What is.

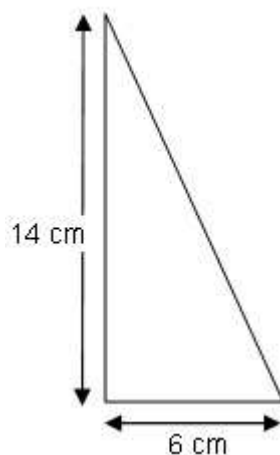
a)  $3\frac{1}{2} + 2\frac{3}{5}$  Write your answer as a mixed number.

.....  
(2)

b)  $3\frac{1}{2} \div 2\frac{3}{5}$  Write your answer as a mixed number.

.....  
(2)

6. a) Calculate the area of this triangle.



.....cm<sup>2</sup>  
(2)

- b) i Calculate the area of a circle with diameter 20 cm.

.....cm<sup>2</sup>  
(2)

- ii This circle is the cross-section of a cylinder of length 10 cm.  
Calculate the volume of the cylinder.

.....cm<sup>3</sup>  
(2)

7. Seven students had a Maths and English test. Here are the scores out of 10.

Student	Maths	English
David	7	7
Jane	8	5
Laura	8	6
Stuart	6	8
Matthew	5	6
Pete	6	7
Vicky	8	3

- a) What is the Range of the English scores

.....  
(1)

- b) What is the Median score for Maths

.....  
(1)

- c) What is the Mean score for English

.....  
(2)



**8. a)** Simplify:

$$6a \times 2a$$

.....  
**(1)**

**b)** Solve  
 $4t - 6 = 14$

$t =$  .....  
**(1)**

**c)** Expand and simplify:

$$5(x + y) + 3(4x - 2y)$$

.....  
**(2)**

**d)** Solve  
 $7(x + 2) = 5x + 21$

$x =$  .....  
**(2)**

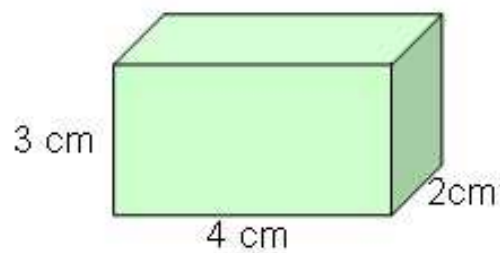
e) Factorise  $y^2 - 49$

.....  
(1)

f) Simplify  $\frac{2x^2 + 7x - 4}{x^2 + 5x + 4}$

.....  
(5)

9. a) Work out the total surface area of this cuboid.

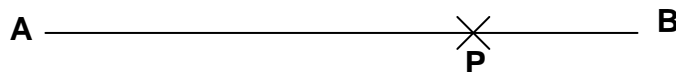


.....cm<sup>2</sup>  
(2)

- b) The cuboid has a density of 7 grams per cm<sup>3</sup>  
What is the mass of the cuboid

.....grams  
(2)

10. A horizontal line AB is drawn below with point P is on the line  
Using a compass and pencil construct a perpendicular line that passes through P.



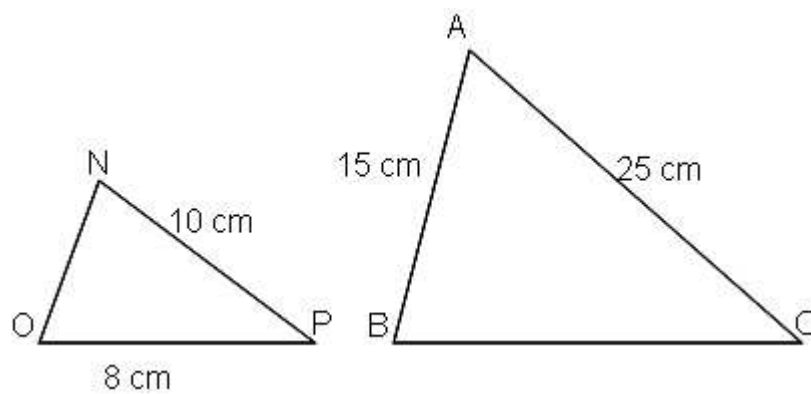
(2)

11. If we take a number and square it, the answer is also the product of the two numbers either side of it plus one. i.e.  $5^2 = 4 \times 6 + 1 = 25$ ;  $6^2 = 5 \times 7 + 1 = 36$ ;

Prove algebraically that this works for all numbers

.....  
(2)

12.



Diagrams NOT  
drawn accurately

The two triangles NOP and ABC are mathematically similar.

Angle N = angle A

Angle P = angle C

OP = 8 cm; NP = 10 cm

AC = 25 cm; AB = 15 cm

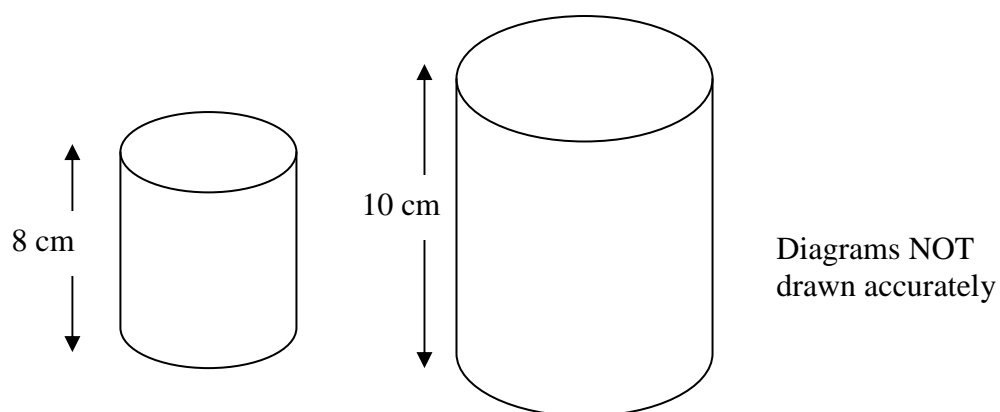
- a) What is the length of BC

.....cm  
(2)

- b) What is the length of NO

.....cm  
(1)

- c) Two mathematically similar cylinders are shown



The volume of the smaller cylinder is  $64 \text{ cm}^3$   
Calculate the volume of the larger cylinder.

..... $\text{cm}^3$   
(2)

- 13.** A survey of 80 children was made to see how long they spent playing computer games in a week

The table below shows how long in hours the children spent.

Time (t hours)	Frequency
$5 \leq t < 10$	10
$10 \leq t < 15$	16
$15 \leq t < 20$	30
$20 \leq t < 25$	21
$25 \leq t < 30$	3

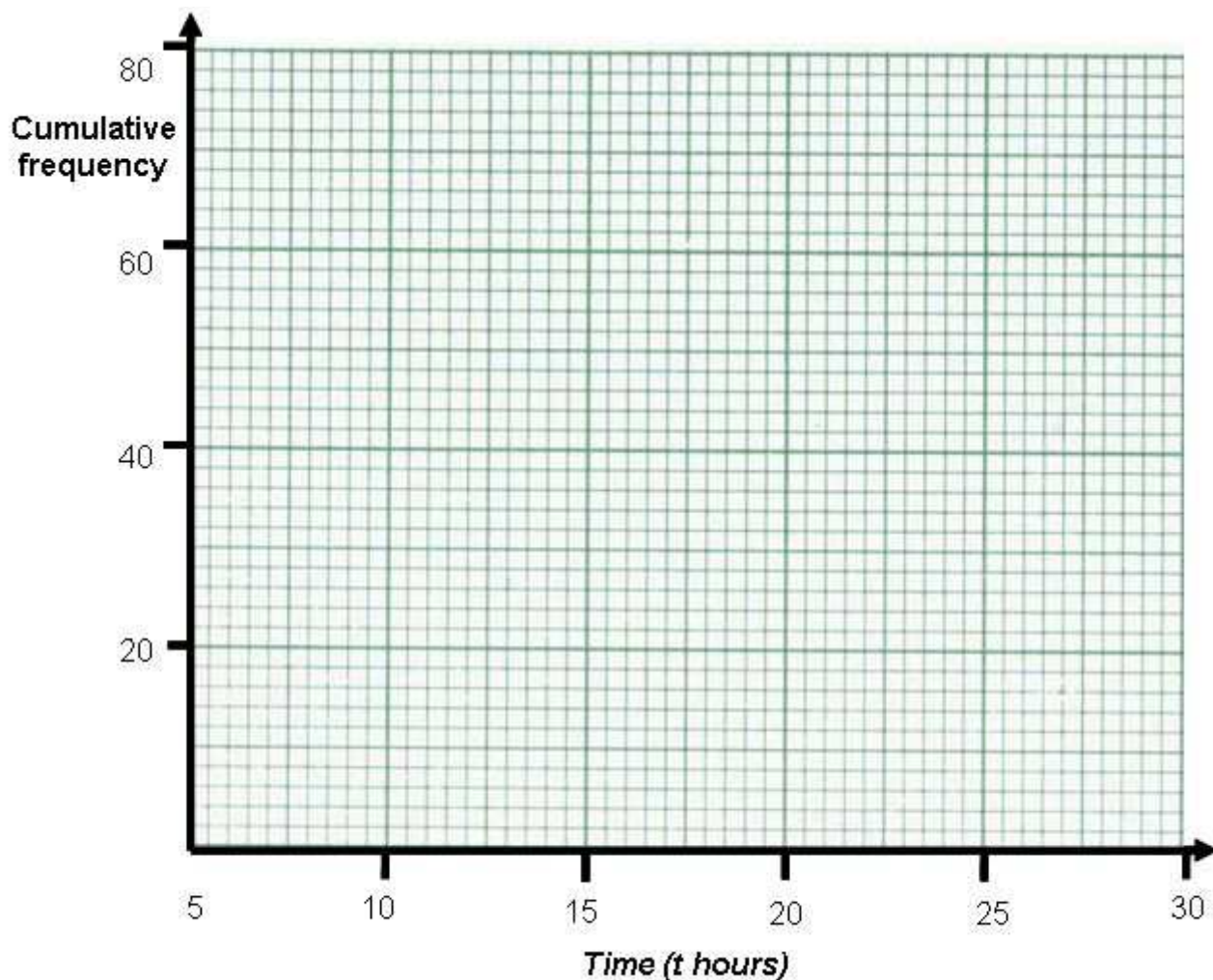
- a)** Complete the cumulative frequency table

**(1)**

Time (t hours)	Cumulative Frequency
$5 \leq t < 10$	10
$5 \leq t < 15$	
$5 \leq t < 20$	
$5 \leq t < 25$	
$5 \leq t < 30$	

- b)** Using your completed table draw a cumulative frequency graph on the grid

**(2)**

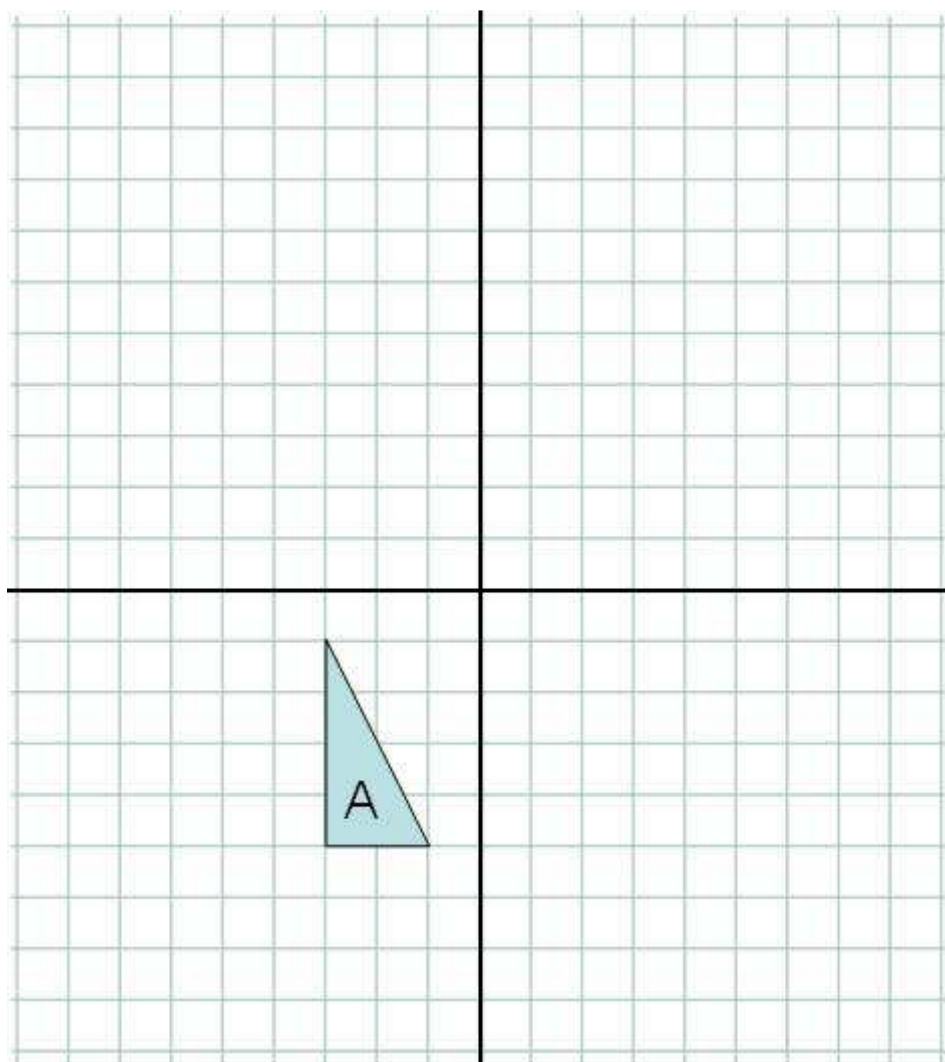


- c) Using the completed graph estimate the median time  
Remember to state the units in your answer

.....  
(2)

14. Enlarge triangle **A** by scale factor  $-2$ , centre  $O$ .

(3)





- 15.** Jane played a game of scrabble and then a game of draughts.  
The probability that she will win the game of scrabble is  $\frac{3}{7}$   
The probability that she will win the game of draughts is  $\frac{2}{5}$

**a)** Draw a probability tree to show this information

**b)** What is the probability that Jane will win one game (2)

.....  
(2)

Jane played a game of scrabble and a game of draughts in several competitions.  
She won at both scrabble and draughts in ten of these competitions.

**c)** Estimate in how many competitions Jane did not win either game.

.....  
(2)

16. Make x the subject of the formula  $3(2x - y) = ax - 4$

.....  
(3)

17. Prove that the recurring decimal  $0.\dot{3}\dot{6} = \frac{4}{11}$

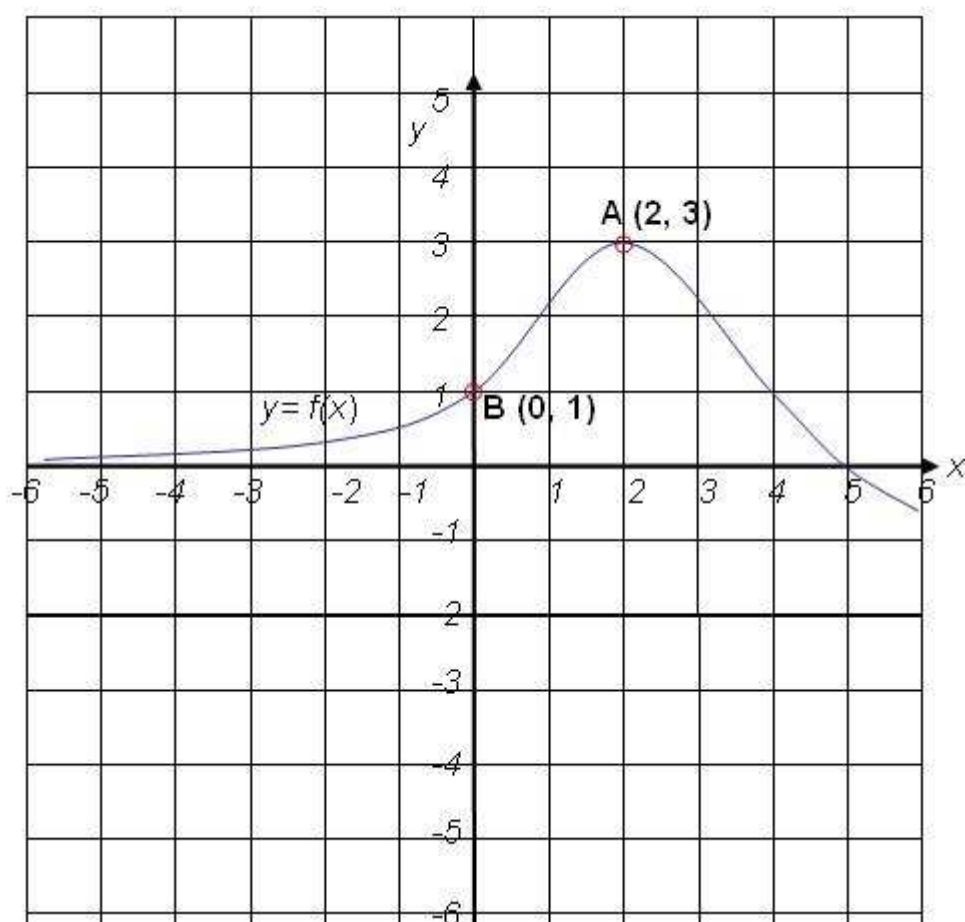
..... (3)

18. Given that  $x^2 - 4x + 11 = (x - a)^2 + b$  find a and b

a = ..... b = .....  
(3)

19. The diagram shows a sketch of  $y = f(x)$ .

- a) Sketch the graph of  $y = 4 - f(x)$  on the grid showing the co-ordinates of points A and B. (3)



- 20.**  $x$  is inversely proportional to the square of  $y$ .  
 $x = 3$  when  $y = 4$

**a)** Express  $x$  in terms of  $y$

$$x = \dots\dots\dots$$

**(2)**

**b)** Work out the value of  $x$  when  $y = 6$

$$x = \dots\dots\dots$$

**(1)**

**c)** Work out the value of positive value of  $y$  when  $x = 12$

$$y = \dots\dots\dots$$

**(1)**

**21.** Find the value of

**a)**  $64^0$

.....

**b)**  $64^{1/2}$

.....

**c)**  $64^{-2/3}$

.....

**(4)**

**d)**  $3\sqrt{n} = 9^{3/2}$   
Find the value of  $n$ .

.....

**(2)**

**e)** Prove that  $(\sqrt{10} + \sqrt{40})^2 = 90$

**(2)**

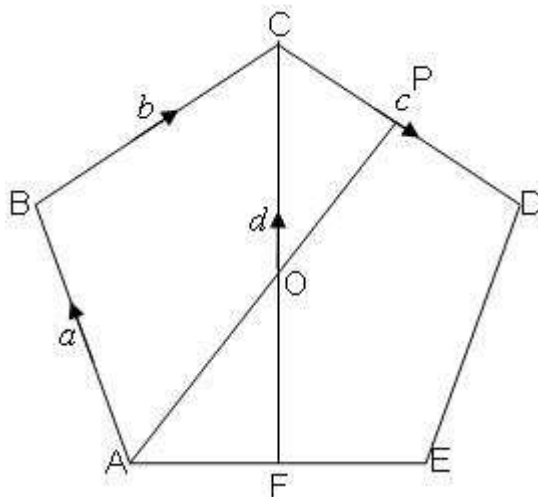
**22. a)** Factorise  $3x^2 + 26x + 16$

.....  
**(2)**

**b)** Solve  $3x^2 + 26x + 16 = 0$

.....  
**(1)**

23.



ABCDE is a regular pentagon

$$\vec{AB} = a \quad \vec{BC} = b \quad \vec{CD} = c \quad \vec{FC} = d$$

P is the mid point of CD and F is the mid point of AE

a) Find the vector  $\vec{AC}$

.....  
(1)

b) Find the vector  $\vec{AP}$

.....  
(2)

O is the mid point of AP and FC

c) Find the vector  $\vec{AF}$

.....  
(2)

---

**TOTAL FOR PAPER: 100 MARKS**  
**END**